

## Part 1: RMI and RMI-IIOP Module Search

Total Marks: 10

### Part 1a (RMI): 4 marks

Implement the `ModuleSearch` client and server applications as described in pages 2 to 5 of this document.

### Part 1b (RMI-IIOP): 6 marks

Implement the `ModuleSearch` client and server applications as described in pages 6 to 9 of this document.

### Submission of Part 1a and 1b

The folders for Part 1a and 1b should include all “.java” and “.class” files and any data files that you may have for the parts. Instructions on *how* to submit the zip file and *how* the assignment will be evaluated are available at the IS2103 IVLE page under the Assessment heading.

### Evaluation of Part 1a and 1b

You will be evaluated on the implementation of the clients and servers of the two applications. You should therefore test them thoroughly to ensure they work in accordance with the specification of the two applications documented below.

# Part 1a: Remote Method Invocation (RMI)

## Module Search

A `ModuleSearchServer` exposes the following interface to its clients:

```
package modulesearch;

import java.rmi.Remote;
import java.rmi.RemoteException;
import java.util.ArrayList;

public interface ModuleSearchServer extends Remote {

    //input : module code (String)
    //output: title of this module (String)
    public String getTitle(String moduleCode)
        throws RemoteException;

    //input : module title (String)
    //output: lecturer's name of this module (String)
    public String getLecturer(String moduleTitle)
        throws RemoteException;

    //input : module level (int)
    //output: list of module codes in this level (ArrayList<String>)
    public ArrayList<String> getModuleList(int moduleLevel)
        throws RemoteException;

}
```

You are required to develop an application that can be used for getting module information in certain level, for example, get module codes, module titles and lecturer names of all 4000 modules.

The interface defines three methods:

1. The `getTitle()` method returns the module title of the given module code. The matching of module codes and module titles is stored in “`module.txt`” file (See Appendix A). If the module code is not found in the server, a “NULL” value is returned.
2. The `getLecturer()` method returns the lecturer’s name of the given module title. The matching of module titles and lecturers is stored in “`lecturer.txt`” file (See Appendix A). If the module title is not found in the server, a “NULL” value is returned.
3. The `getModuleList()` method returns a list of all module codes in a given level. The value of module level can only be: 1000, 2000, 3000, 4000, 5000 and 6000. If the module level is not found in the server, a “NULL” value is returned.

You are required to implement the `ModuleSearchServer` interface. You may implement the methods in whatever way you deem fit subject to the following conditions:

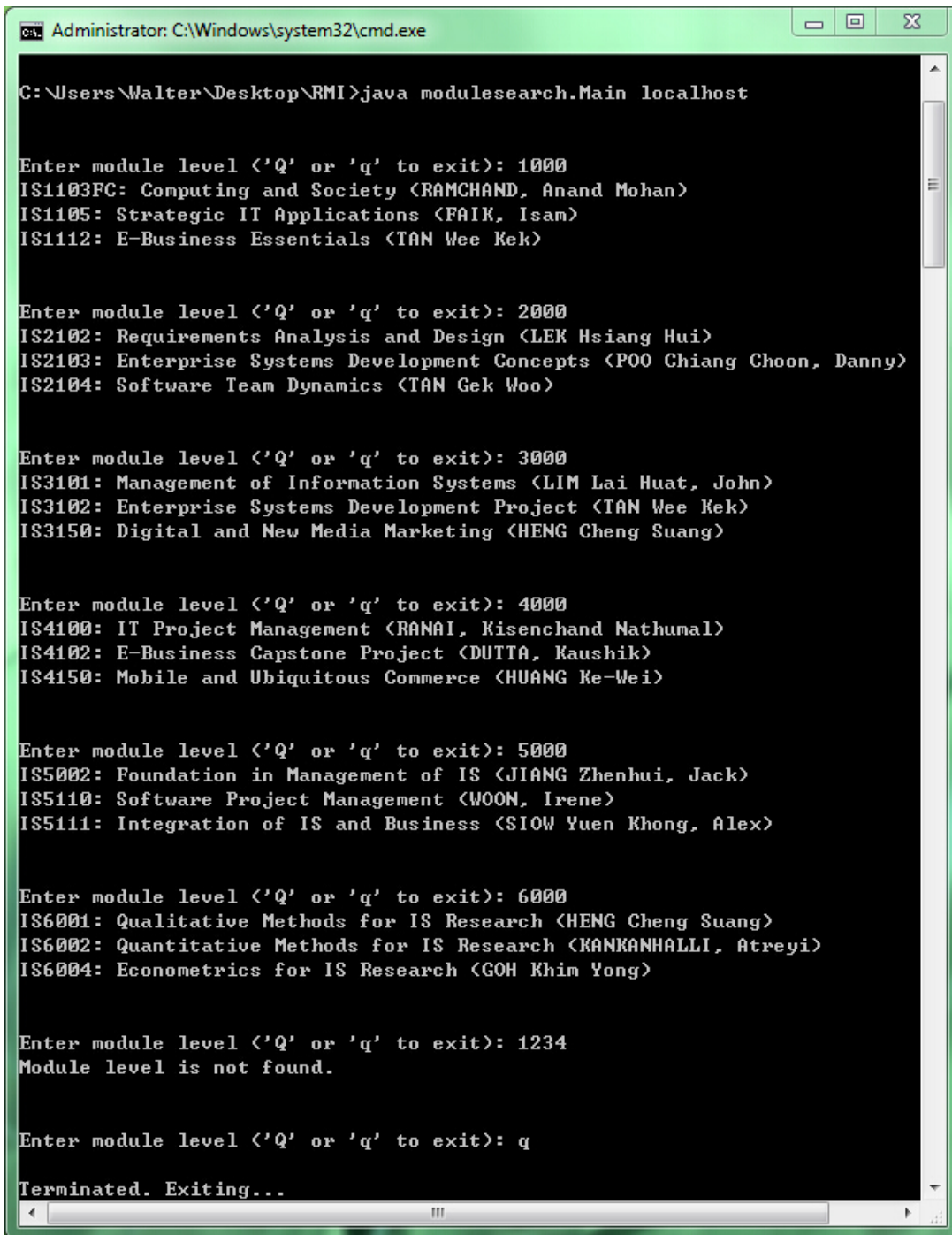
1. There are 18 modules belonging to 6 levels (from 1000 to 6000) provided. You are required to use “`module.txt`”, “`lecturer.txt`” in implementing the server.
2. Name the implementation class of the `ModuleSearchServer` interface as

`ModuleSearchServerImpl`. Produce an accompanying server application class to start the server. Name the server application as `ModuleSearchServerApp`.

Create a client application and name it as `Main`. Your client application should be able to demonstrate the following functionalities:

- ☐ Able to connect to the server via the RMI protocol using the default port 1099. For Macintosh users, you may use other port if necessary.
- ☐ It has one argument “localhost” entered at the DOS prompt. This argument denotes the server’s IP address.
- ☐ Able to repeatedly call the server’s `getTitle()` method to enquire on the module title of a module code, `getLecturer()` method to get the lecturer’s name of a given module title, `getModuleList()` method to get a list of module codes in a given level. If modules are found in the given level, a list of module details, including module codes, module titles and lecturer names, will be displayed. If an invalid module level is requested, the client application will display “Module level is not found”.
- ☐ Able to terminate the repeated call when the user is done with your client application.

The following is a series of outputs at the client side:



```
Administrator: C:\Windows\system32\cmd.exe

C:\Users\Walter\Desktop\RMI>java modulesearch.Main localhost

Enter module level ('Q' or 'q' to exit): 1000
IS1103FC: Computing and Society <RAMCHAND, Anand Mohan>
IS1105: Strategic IT Applications <FAIK, Isam>
IS1112: E-Business Essentials <TAN Wee Kek>

Enter module level ('Q' or 'q' to exit): 2000
IS2102: Requirements Analysis and Design <LEK Hsiang Hui>
IS2103: Enterprise Systems Development Concepts <POO Chiang Choon, Danny>
IS2104: Software Team Dynamics <TAN Gek Woo>

Enter module level ('Q' or 'q' to exit): 3000
IS3101: Management of Information Systems <LIM Lai Huat, John>
IS3102: Enterprise Systems Development Project <TAN Wee Kek>
IS3150: Digital and New Media Marketing <HENG Cheng Suang>

Enter module level ('Q' or 'q' to exit): 4000
IS4100: IT Project Management <RANAI, Kisenchand Nathumal>
IS4102: E-Business Capstone Project <DUTTA, Kaushik>
IS4150: Mobile and Ubiquitous Commerce <HUANG Ke-Wei>

Enter module level ('Q' or 'q' to exit): 5000
IS5002: Foundation in Management of IS <JIANG Zhenhui, Jack>
IS5110: Software Project Management <WOON, Irene>
IS5111: Integration of IS and Business <SIOW Yuen Khong, Alex>

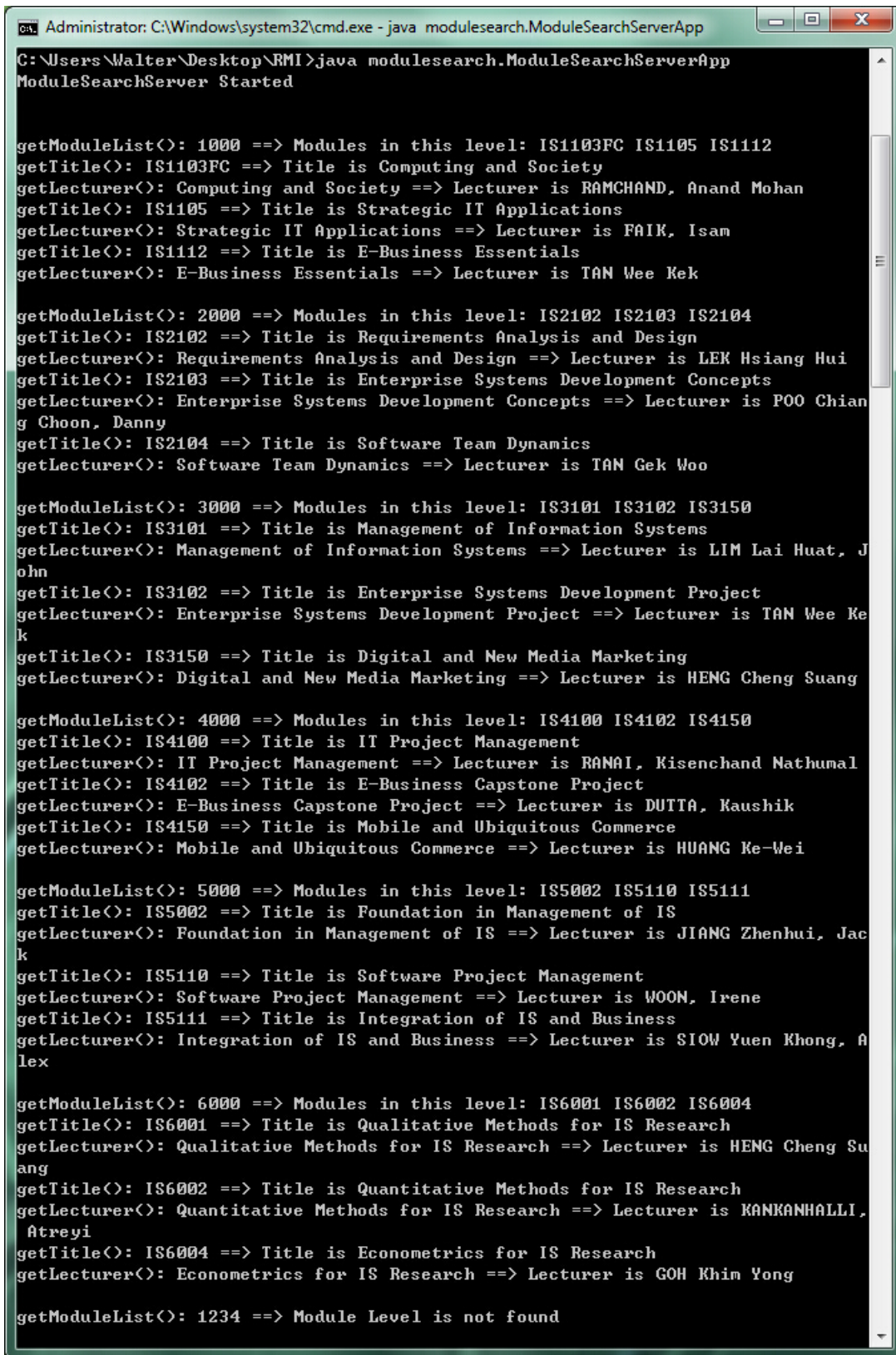
Enter module level ('Q' or 'q' to exit): 6000
IS6001: Qualitative Methods for IS Research <HENG Cheng Suang>
IS6002: Quantitative Methods for IS Research <KANKANHALLI, Atreyi>
IS6004: Econometrics for IS Research <GOH Khim Yong>

Enter module level ('Q' or 'q' to exit): 1234
Module level is not found.

Enter module level ('Q' or 'q' to exit): q

Terminated. Exiting...
```

The following is the corresponding outputs at the server side:



```
Administrator: C:\Windows\system32\cmd.exe - java modulesearch.ModuleSearchServerApp
C:\Users\Walter\Desktop\RMI>java modulesearch.ModuleSearchServerApp
ModuleSearchServer Started

getModuleList(): 1000 ==> Modules in this level: IS1103FC IS1105 IS1112
getTitle(): IS1103FC ==> Title is Computing and Society
getLecturer(): Computing and Society ==> Lecturer is RAMCHAND, Anand Mohan
getTitle(): IS1105 ==> Title is Strategic IT Applications
getLecturer(): Strategic IT Applications ==> Lecturer is FAIR, Isam
getTitle(): IS1112 ==> Title is E-Business Essentials
getLecturer(): E-Business Essentials ==> Lecturer is TAN Wee Kek

getModuleList(): 2000 ==> Modules in this level: IS2102 IS2103 IS2104
getTitle(): IS2102 ==> Title is Requirements Analysis and Design
getLecturer(): Requirements Analysis and Design ==> Lecturer is LEK Hsiang Hui
getTitle(): IS2103 ==> Title is Enterprise Systems Development Concepts
getLecturer(): Enterprise Systems Development Concepts ==> Lecturer is POO Chian
g Choon, Danny
getTitle(): IS2104 ==> Title is Software Team Dynamics
getLecturer(): Software Team Dynamics ==> Lecturer is TAN Gek Woo

getModuleList(): 3000 ==> Modules in this level: IS3101 IS3102 IS3150
getTitle(): IS3101 ==> Title is Management of Information Systems
getLecturer(): Management of Information Systems ==> Lecturer is LIM Lai Huat, J
ohn
getTitle(): IS3102 ==> Title is Enterprise Systems Development Project
getLecturer(): Enterprise Systems Development Project ==> Lecturer is TAN Wee Ke
k
getTitle(): IS3150 ==> Title is Digital and New Media Marketing
getLecturer(): Digital and New Media Marketing ==> Lecturer is HENG Cheng Suang

getModuleList(): 4000 ==> Modules in this level: IS4100 IS4102 IS4150
getTitle(): IS4100 ==> Title is IT Project Management
getLecturer(): IT Project Management ==> Lecturer is RANAI, Kisenchand Nathumal
getTitle(): IS4102 ==> Title is E-Business Capstone Project
getLecturer(): E-Business Capstone Project ==> Lecturer is DUTTA, Kaushik
getTitle(): IS4150 ==> Title is Mobile and Ubiquitous Commerce
getLecturer(): Mobile and Ubiquitous Commerce ==> Lecturer is HUANG Ke-Wei

getModuleList(): 5000 ==> Modules in this level: IS5002 IS5110 IS5111
getTitle(): IS5002 ==> Title is Foundation in Management of IS
getLecturer(): Foundation in Management of IS ==> Lecturer is JIANG Zhenhui, Jac
k
getTitle(): IS5110 ==> Title is Software Project Management
getLecturer(): Software Project Management ==> Lecturer is WOON, Irene
getTitle(): IS5111 ==> Title is Integration of IS and Business
getLecturer(): Integration of IS and Business ==> Lecturer is SIOH Yuen Khong, A
lex

getModuleList(): 6000 ==> Modules in this level: IS6001 IS6002 IS6004
getTitle(): IS6001 ==> Title is Qualitative Methods for IS Research
getLecturer(): Qualitative Methods for IS Research ==> Lecturer is HENG Cheng Su
ang
getTitle(): IS6002 ==> Title is Quantitative Methods for IS Research
getLecturer(): Quantitative Methods for IS Research ==> Lecturer is KANKANHALLI,
Atreyi
getTitle(): IS6004 ==> Title is Econometrics for IS Research
getLecturer(): Econometrics for IS Research ==> Lecturer is GOH Khim Yong

getModuleList(): 1234 ==> Module Level is not found
```

## Part 1b: RMI-IIOP

### Module Search

A `ModuleSearchServer` exposes the following interface to its clients:

```
package modulesearch;

import java.rmi.Remote;
import java.rmi.RemoteException;
import java.util.ArrayList;

public interface ModuleSearchServer extends Remote {

    //input : module code (String)
    //output: title of this module (String)
    public String getTitle(String moduleCode)
        throws RemoteException;

    //input : module title (String)
    //output: lecturer's name of this module (String)
    public String getLecturer(String moduleTitle)
        throws RemoteException;

    //input : module level (int)
    //output: list of module codes in this level (ArrayList<String>)
    public ArrayList<String> getModuleList(int moduleLevel)
        throws RemoteException;

}
```

You are required to develop an application that can be used for getting module information in certain level, e.g. get module codes, module titles and lecturer names of all 4000 modules.

The interface defines three methods:

4. The `getTitle()` method returns the module title of the given module code. The matching of module codes and module titles is stored in “`module.txt`” file (See Appendix A). If the module code is not found in the server, a “NULL” value is returned.
5. The `getLecturer()` method returns the lecturer's name of the given module title. The matching of module titles and lecturer is stored in “`lecturer.txt`” file (See Appendix A). If the module title is not found in the server, a “NULL” value is returned.
6. The `getModuleList()` method returns a list of all module codes in a given level. The value of module level can only be: 1000, 2000, 3000, 4000, 5000 and 6000. If the module level is not found in the server, a “NULL” value is returned.

You are required to implement the `ModuleSearchServer` interface. You may implement the methods in whatever way you deem fit subject to the following conditions:

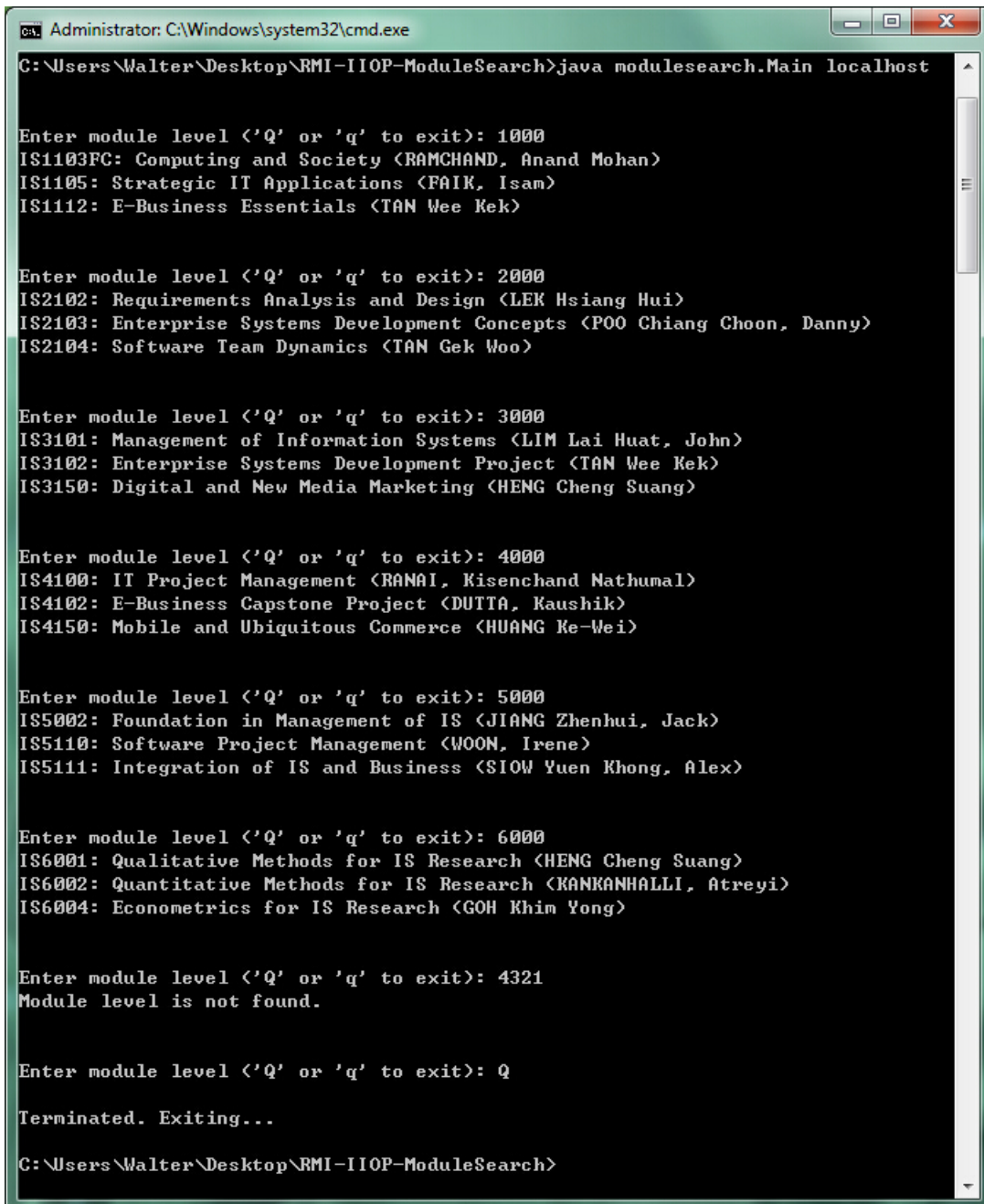
3. There are 18 modules belonging to 6 levels (from 1000 to 6000) listed. You are required to use “`module.txt`”, “`lecturer.txt`” in implementing the server.
4. Name the implementation class of the `ModuleSearchServer` interface as

ModuleSearchServerImpl. Produce an accompanying server application class to start the server. Name the server application as ModuleSearchServerApp.

Create a client application and name it as Main. Your client should be able to demonstrate the following functionalities:

- ☐ Able to connect to the server via the RMI-IIOP protocol using the default port 900. For Macintosh users, you may use other port if necessary.
- ☐ It has one argument “localhost” entered at the DOS prompt. This argument denotes the server’s IP address.
- ☐ Able to repeatedly call the server’s getTitle() method to enquire on the module title of a module code, getLecturer() method to get the lecturer’s name of a given module title, getModuleList() method to get a list of module codes in a given level. If modules are found in the given level, a list of module details, including module codes, module titles and lecturer names, will be displayed. If an invalid module level is requested, the client application will display “Module level is not found”.
- ☐ Able to terminate the repeated call when the user is done with your client application.

The following is a series of outputs at the client side:



```
Administrator: C:\Windows\system32\cmd.exe
C:\Users\Walter\Desktop\RMI-IIOP-ModuleSearch>java modulesearch.Main localhost

Enter module level ('Q' or 'q' to exit): 1000
IS1103FC: Computing and Society <RAMCHAND, Anand Mohan>
IS1105: Strategic IT Applications <PAIK, Isan>
IS1112: E-Business Essentials <TAN Wee Kek>

Enter module level ('Q' or 'q' to exit): 2000
IS2102: Requirements Analysis and Design <LEK Hsiang Hui>
IS2103: Enterprise Systems Development Concepts <POO Chiang Choon, Danny>
IS2104: Software Team Dynamics <TAN Gek Woo>

Enter module level ('Q' or 'q' to exit): 3000
IS3101: Management of Information Systems <LIM Lai Huat, John>
IS3102: Enterprise Systems Development Project <TAN Wee Kek>
IS3150: Digital and New Media Marketing <HENG Cheng Suang>

Enter module level ('Q' or 'q' to exit): 4000
IS4100: IT Project Management <RANAI, Kisenchand Nathumal>
IS4102: E-Business Capstone Project <DUTTA, Kaushik>
IS4150: Mobile and Ubiquitous Commerce <HUANG Ke-Wei>

Enter module level ('Q' or 'q' to exit): 5000
IS5002: Foundation in Management of IS <JIANG Zhenhui, Jack>
IS5110: Software Project Management <WOON, Irene>
IS5111: Integration of IS and Business <SIOW Yuen Khong, Alex>

Enter module level ('Q' or 'q' to exit): 6000
IS6001: Qualitative Methods for IS Research <HENG Cheng Suang>
IS6002: Quantitative Methods for IS Research <KANKANHALLI, Atreyi>
IS6004: Econometrics for IS Research <GOH Khim Yong>

Enter module level ('Q' or 'q' to exit): 4321
Module level is not found.

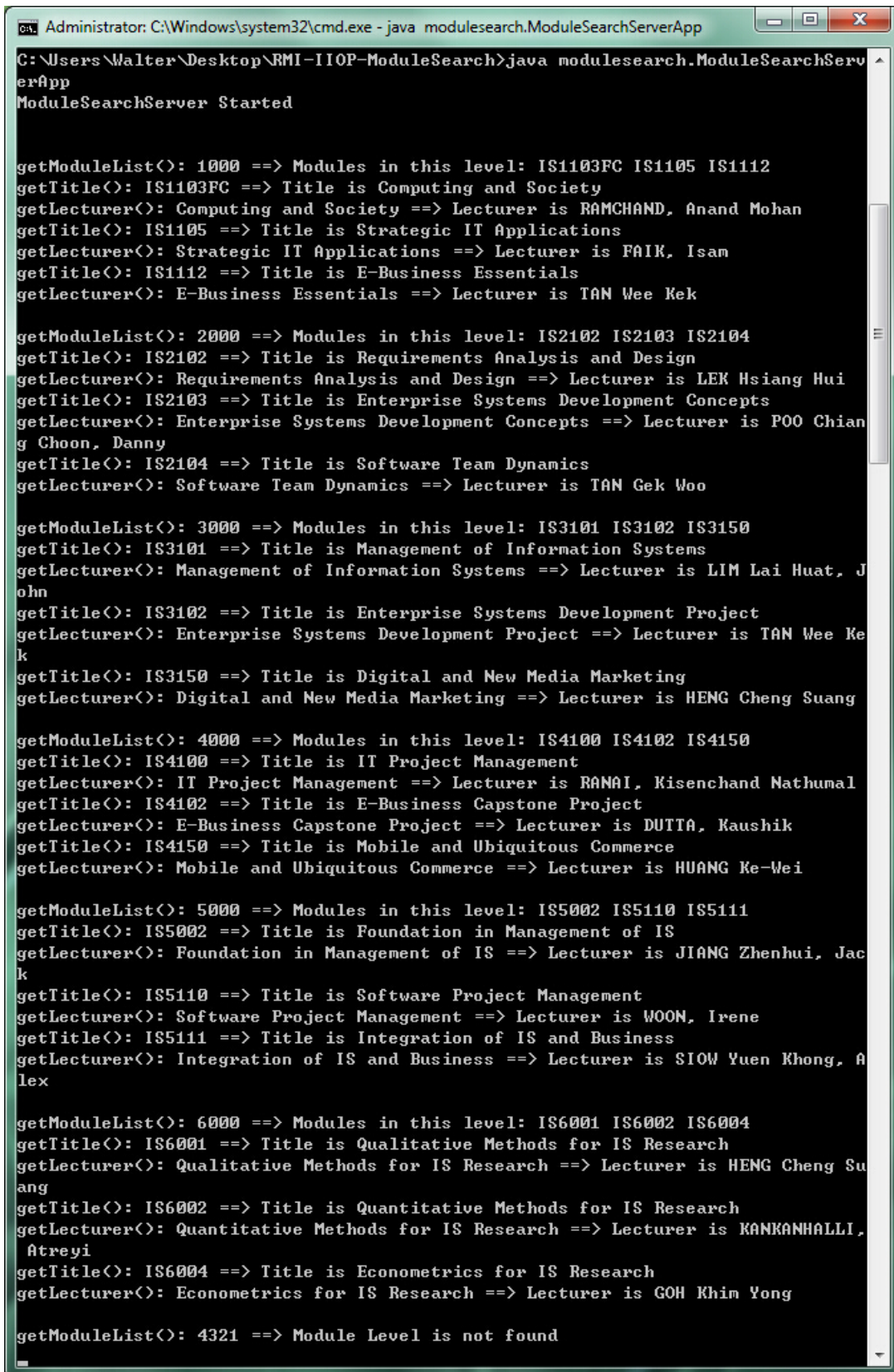
Enter module level ('Q' or 'q' to exit): Q

Terminated. Exiting...

C:\Users\Walter\Desktop\RMI-IIOP-ModuleSearch>
```



The following is the corresponding outputs at the server side:



```
Administrator: C:\Windows\system32\cmd.exe - java modulesearch.ModuleSearchServerApp
C:\Users\Walter\Desktop\NMI-IIOP-ModuleSearch>java modulesearch.ModuleSearchServerApp
ModuleSearchServer Started

getModuleList(): 1000 ==> Modules in this level: IS1103FC IS1105 IS1112
getTitle(): IS1103FC ==> Title is Computing and Society
getLecturer(): Computing and Society ==> Lecturer is RAMCHAND, Anand Mohan
getTitle(): IS1105 ==> Title is Strategic IT Applications
getLecturer(): Strategic IT Applications ==> Lecturer is FAIK, Isam
getTitle(): IS1112 ==> Title is E-Business Essentials
getLecturer(): E-Business Essentials ==> Lecturer is TAN Wee Kek

getModuleList(): 2000 ==> Modules in this level: IS2102 IS2103 IS2104
getTitle(): IS2102 ==> Title is Requirements Analysis and Design
getLecturer(): Requirements Analysis and Design ==> Lecturer is LEK Hsiang Hui
getTitle(): IS2103 ==> Title is Enterprise Systems Development Concepts
getLecturer(): Enterprise Systems Development Concepts ==> Lecturer is POO Chian
g Choon, Danny
getTitle(): IS2104 ==> Title is Software Team Dynamics
getLecturer(): Software Team Dynamics ==> Lecturer is TAN Gek Woo

getModuleList(): 3000 ==> Modules in this level: IS3101 IS3102 IS3150
getTitle(): IS3101 ==> Title is Management of Information Systems
getLecturer(): Management of Information Systems ==> Lecturer is LIM Lai Huat, J
ohn
getTitle(): IS3102 ==> Title is Enterprise Systems Development Project
getLecturer(): Enterprise Systems Development Project ==> Lecturer is TAN Wee Ke
k
getTitle(): IS3150 ==> Title is Digital and New Media Marketing
getLecturer(): Digital and New Media Marketing ==> Lecturer is HENG Cheng Suang

getModuleList(): 4000 ==> Modules in this level: IS4100 IS4102 IS4150
getTitle(): IS4100 ==> Title is IT Project Management
getLecturer(): IT Project Management ==> Lecturer is RANAI, Kisenchand Nathumal
getTitle(): IS4102 ==> Title is E-Business Capstone Project
getLecturer(): E-Business Capstone Project ==> Lecturer is DUTTA, Kaushik
getTitle(): IS4150 ==> Title is Mobile and Ubiquitous Commerce
getLecturer(): Mobile and Ubiquitous Commerce ==> Lecturer is HUANG Ke-Wei

getModuleList(): 5000 ==> Modules in this level: IS5002 IS5110 IS5111
getTitle(): IS5002 ==> Title is Foundation in Management of IS
getLecturer(): Foundation in Management of IS ==> Lecturer is JIANG Zhenhui, Jac
k
getTitle(): IS5110 ==> Title is Software Project Management
getLecturer(): Software Project Management ==> Lecturer is WOON, Irene
getTitle(): IS5111 ==> Title is Integration of IS and Business
getLecturer(): Integration of IS and Business ==> Lecturer is SLOW Yuen Khong, A
lex

getModuleList(): 6000 ==> Modules in this level: IS6001 IS6002 IS6004
getTitle(): IS6001 ==> Title is Qualitative Methods for IS Research
getLecturer(): Qualitative Methods for IS Research ==> Lecturer is HENG Cheng Su
ang
getTitle(): IS6002 ==> Title is Quantitative Methods for IS Research
getLecturer(): Quantitative Methods for IS Research ==> Lecturer is KANKANHALLI,
Atreyi
getTitle(): IS6004 ==> Title is Econometrics for IS Research
getLecturer(): Econometrics for IS Research ==> Lecturer is GOH Khim Yong

getModuleList(): 4321 ==> Module Level is not found
```

## **Appendix A: Code-Title List, Title-Lecturer List**

### **Content of “module.txt” (module\_code:module\_title):**

IS1103FC:Computing and Society  
IS1105:Strategic IT Applications  
IS1112:E-Business Essentials  
IS2102:Requirements Analysis and Design  
IS2103:Enterprise Systems Development Concepts  
IS2104:Software Team Dynamics  
IS3101:Management of Information Systems  
IS3102:Enterprise Systems Development Project  
IS3150:Digital and New Media Marketing  
IS4100:IT Project Management  
IS4102:E-Business Capstone Project  
IS4150:Mobile and Ubiquitous Commerce  
IS5002:Foundation in Management of IS  
IS5110:Software Project Management  
IS5111:Integration of IS and Business  
IS6001:Qualitative Methods for IS Research  
IS6002:Quantitative Methods for IS Research  
IS6004:Econometrics for IS Research

### **Content of “lecturer.txt” (module\_title:lecturer\_name):**

Computing and Society:RAMCHAND, Anand Mohan  
Strategic IT Applications:FAIK, Isam  
E-Business Essentials:TAN Wee Kek  
Requirements Analysis and Design:LEK Hsiang Hui  
Enterprise Systems Development Concepts:POO Chiang Choon, Danny  
Software Team Dynamics:TAN Gek Woo  
Management of Information Systems:LIM Lai Huat, John  
Enterprise Systems Development Project:TAN Wee Kek  
Digital and New Media Marketing:HENG Cheng Suang  
IT Project Management:RANAI, Kisenchand Nathumal  
E-Business Capstone Project:DUTTA, Kaushik  
Mobile and Ubiquitous Commerce:HUANG Ke-Wei  
Foundation in Management of IS:JIANG Zhenhui, Jack  
Software Project Management:WOON, Irene  
Integration of IS and Business:SIOW Yuen Khong, Alex  
Qualitative Methods for IS Research:HENG Cheng Suang  
Quantitative Methods for IS Research:KANKANHALLI, Atreyi  
Econometrics for IS Research:GOH Khim Yong